PATENT ABSTRACTS OF JAPAN

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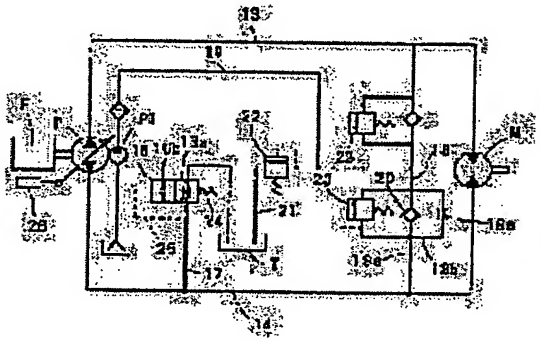
(54) HYDROSTATIC CONTINUOUSLY VARIABLE TRANSMISSION DEVICE FOR RUNNING

(57)Abstract:

PROBLEM TO BE SOLVED: To widen a neutral area of a swash plate operation member while reducing driving loss.

SOLUTION: A first-oil discharge passage 17 having a neutral valve 16 and a second oil discharge passage 18 having a restriction part 18a are connected to a driving oil passage 14 which connects a hydraulic pump P to a hydraulic motor M. The neutral valve 16 is in an opening state 16a in the case that the pressure in the driving oil passage 14 is lower than the set pressure which is set higher than a relief pressure of a relief valve 22. At this time, pressure oil inside the driving oil passage 14 is discharged through the first and second oil discharge passages 17, 18. The hydraulic motor M is thus stopped. The neutral valve 16 is switched to a closing state 16b in the case that the pressure in the driving oil passage 14 is the set pressure or higher. The pressure oil in the driving oil passage 14 is partly discharged through the second oil discharge passage 18 while driving the hydraulic motor M.



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CLAIMS

[Claim(s)]
[Claim 1] The hydrostatic formula stepless gearbox for a run which changes with the variable-capacity type hydraulic pump characterized by providing the following, and a hydraulic motor. The 1st drain oil way which has the neutral valve which will close automatically, will switch to a state if the drive oilway which connects the aforementioned hydraulic pump and the aforementioned hydraulic motor becomes more than a set pressure, will open automatically and will switch to a state if the aforementioned drive oilway becomes small ** from a set pressure. Converging section.
[Claim 2] The hydrostatic formula stepless gearbox for a run according to claim 1 constituted so that change operation of the cam-plate angle of the aforementioned hydraulic pump may be carried out with an actuator.
[Claim 3] The hydrostatic formula stepless gearbox for a run according to claim 1 or 2 which has connected the aforementioned 1st drain oil way and the aforementioned 2nd drain oil way only to the drive oilway which becomes the high-tension side at the time of the go-astern side drive of the drive oilways of the couple which connects the aforementioned hydraulic pump and the aforementioned hydraulic motor.
[Claim 4] Between the go-astern operation region for having the gearshift lever which changes the cam-plate angle of the aforementioned hydraulic pump, and driving the aforementioned hydraulic pump to a go-astern side, and the center valve position for maintaining the aforementioned hydraulic motor to a idle state The hydrostatic formula stepless gearbox for a run according to claim 3 constituted so that the change promotion position which drive operation of the hydraulic pump is carried out [position] at an advance side, and promotes a switch of the aforementioned neutral valve is prepared, and the aforementioned change promotion position may be made to pass since a go-astern operation region, and a gearshift lever may be switched to a center valve position and may be operated.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the hydrostatic formula stepless gearbox for a run which changes with a variable-capacity type hydraulic pump and a hydraulic motor.
[0002]
[Description of the Prior Art] In the above-mentioned stepless gearbox, so that it may be shown in the former, for example, JP,62-132066,A Even if it connects the drain oil way which has a pilot formula opening-and-closing valve as a neutral valve to the drive oilway which connects a hydraulic motor with a hydraulic pump and operates a hydraulic pump from a neutral state to a high speed side If a hydraulic motor does not drive but a drive oilway becomes high pressure in order for an opening-and-closing valve to open, to be in the state and to discharge the pressure oil from a hydraulic pump while a drive oilway is in small ** In order that an opening-and-closing valve might close automatically, might switch to a state and might enable pressure-oil supply to a hydraulic motor, there were some which a hydraulic motor drives. This can be controlled in the neutral state which a hydraulic motor does not rotate and carries out an output halt as a stepless gearbox, not only when the cam-plate operating member of a hydraulic pump is operated to the actuated valve position to which a hydraulic pump stops pressure-oil supply, but when it operates it to the actuated valve position in which separates from this actuated valve position for a while, and a hydraulic pump carries out pressure-oil supply by low voltage. Namely, the neutral zone of cam-plate operating member can be formed now more widely than that to which a hydraulic pump stops pressure-oil supply.
[0003]
[Problem(s) to be Solved by the Invention] For example, it is easy to make it stop so that it may not come out of cam-plate operating member to a neutral zone from now on, even if it may stop, since it moves too much for a while when operating the cam-plate operating member of a hydraulic pump with actuators, such as an electric cylinder, carrying out gear change operation and an actuator receives [the neutral zone of cam-plate operating member] a stop signal for latus, and gear change operation can be carried out advantageously. However, in the case of the above-mentioned conventional neutral-zone expansion technology, the pressure of the drive oilway at the time of opening a neutral valve, closing from a state and switching to a state was high considering the size of a neutral zone. Consequently, when making an airframe run start, after the pressure of a drive oilway rose to high pressure, when a motor begins to have moved, an airframe departed suddenly and an airframe run was stopped, before the pressure of a drive oilway fully declined, the trouble where a motor stopped and an airframe run stopped suddenly had occurred. The purpose of this invention is [while avoiding the above-mentioned trouble, and] to offer the stepless gearbox which can make a neutral zone large, finishing an output loss few as much as possible.
[0004]
[Means for Solving the Problem] The composition of invention by the claim 1, an operation, and the effect are as follows.

[0005] [Composition] If the drive oilway which connects the aforementioned hydraulic pump and the aforementioned hydraulic motor becomes in the hydrostatic formula stepless gearbox for a run which changes with a variable-capacity type hydraulic pump and a hydraulic motor more than a set pressure, it closes automatically and it will switch to a state, and if the aforementioned drive oilway becomes small ** from a set pressure, the 1st drain-oil way which has the neutral valve which opens automatically and switches to a state, and the 2nd drain-oil way which it has in a converging section have connected to the aforementioned drive oilway
[0006] [Operation] A neutral valve opens and it is in a state, and the pressure oil from a pump is discharged from both the drain oil way of the 1st drain oil way and the 2nd drain oil way, and does not drive a hydraulic motor, but a stepless gearbox is in a neutral state until a drive oilway reaches a set pressure, even if it will move the cam-plate operating member of a hydraulic pump from the actuated valve position which stops pressure-oil supply of a pump and a pump will perform pressure-oil supply. If cam-plate operating member is moved further and a drive oilway reaches a set pressure, after this, a neutral valve closes, it switches to a state, and a part of pressure oil from a pump is discharged from the 2nd drain oil way, the remaining oils drive a hydraulic motor and a stepless gearbox will be in a drive state. For this reason, the neutral zone of cam-plate operating member becomes the latus thing which consists of an actuated valve position to which a hydraulic pump stops pressure-oil supply, and an actuated valve position into which a pressure oil flows out of the 1st drain oil way and the 2nd drain oil way by low voltage even if a hydraulic pump carries out pressure-oil supply. And since a neutral zone is expanded by the drain oil by both the drain oil way of the 1st drain oil way which stops a drain oil operation in connection with oilway ******, and the 2nd drain oil way which performs a drain oil operation also after oilway ****** It compares with the former which had adopted only the drain oil way which stops a drain oil operation in connection with oilway ******, and-izing of the neutral zone can be carried out [****] to the thing of the same size, setting the aforementioned set pressure of the drive oilway at the time of a neutral valve opening and switching to shell closing as a low pressure.
[0007] Even if it has only the drain oil way which performs a drain oil operation after ****** goes up without having the drain oil way which stops a drain oil operation by oilway ******,-izing of the neutral zone can be carried out [****]. That is, even if it will move the cam-plate operating member of a hydraulic pump from the actuated valve position which stops pressure-oil supply of a pump and a pump will carry out pressure-oil supply, while the whole quantity of the pressure oil from a pump flows out of a drain oil way, a hydraulic motor does not drive but a stepless gearbox is in a neutral state. If cam-plate operating member is moved further, a part of pressure oil from a pump is discharged from a drain oil way and the remaining pressure oil comes to act on a hydraulic motor, a hydraulic motor drives and a stepless gearbox will be in a drive state. In this case, in case a hydraulic motor drives in securing the neutral zone of the same size as compared with this invention equipped with both the drain oil way of the 1st drain oil way and the 2nd drain oil way, the pressure oil which flows out of a drain oil way increases, and the rate of the pump output which can be used for the drive of a motor falls.
[0008] [Effect] The neutral zone of cam-plate operating member is formed widely. in artificial operation It is easy to operate it so that it may not separate from cam-plate operating member from now on in a neutral zone, and gear change operation can be carried out so that it may be easy to appear a run halt. in actuator operation Even if it might say that it stopped since it moves too much for a while when an actuator receives a stop signal, it was easy to make it stop so that it may not come out of cam-plate operating member to a neutral zone from now on, and was made to what can carry out gear change operation so that it may be easy to appear a run halt. And while the neutral valve switched considering the size of a neutral zone by low drive ******, it was made to what has high performance traverse so that motorised [with a pump] might be performed efficiently and the high-speed run of it could be carried out as much as possible, using an output without futility, and so that start and a halt shock could run comfortably [it is few and].
[0009] The composition of invention by the claim 2, an operation, and the effect are as follows.
[0010] [Composition] In the composition of invention by the claim 1, it constitutes so that

change operation of the cam-plate angle of the aforementioned hydraulic pump may be carried out with an actuator.
[0011] [Operation] By operating an actuator, with a bitter taste tutor's driving force, a cam-plate angle is changed and it can change gears. And since it moves too much for a while when an actuator receives a stop signal, since the neutral zone of cam-plate operating member can be formed widely, even if it may stop, gear change operation can be carried out in the state of being easy to make it stopping so that it may not separate from cam-plate operating member from now on in a neutral zone.
[0012] [Effect] While being able to carry out gear change operation lightly, even if control precision is not so high, it becomes what was excellent in the field of operability and reliability so that a run halt could be appeared certainly.
[0013] The composition of invention by the claim 3, an operation, and the effect are as follows.
[0014] [Composition] In the composition of invention by the claim 1 or 2, the aforementioned 1st drain oil way and the aforementioned 2nd drain oil way are connected only to the drive oilway which becomes the high-tension side at the time of the go-astern side drive of the drive oilways of the couple which connects the aforementioned hydraulic pump and the aforementioned hydraulic motor.
[0015] [Operation] When the 1st drain oil way and the 2nd drain oil way are connected to all of the drive oilway of the couple which connects a motor with a pump, a motor will be driven making a part of pressure oil from a pump flow out of the 2nd drain oil way also in any at the time of advance and go-astern. On the other hand, although a motor will be driven in the composition by the claim 3, making a part of pressure oil from a pump flow out of the 2nd drain oil way at the time of go-astern, a motor will be driven by the whole quantity of the pressure oil from a pump at the time of advance. That is, in the case of the former, in the composition by the claim 3, at the time of advance, a neutral zone will be expansion-ized in the state where a pump output is not lost, to a neutral zone being expansion-ized in the state of losing a part of pump output also at the time of go-astern, also at the time of advance.
[0016] [Effect] — while finishing loss of a pump output few as the whole that a motor can be driven by the whole quantity of the pressure oil from a pump at the time of before **, and by generally performing the advance run frequently rather than a go-astern run — a neutral zone — large — carrying out — a run halt — operation — it is obtained by the state where high-speed advance can be carried out as much as possible while being able to run that which is easily been easy to appear, using a pump output efficiently
[0017] The composition of invention by the claim 4, an operation, and the effect are as follows.
[0018] [Composition] The go-astern operation region for having the gearshift lever which changes the cam-plate angle of the aforementioned hydraulic pump in the composition of this invention by the claim 3, and driving the aforementioned hydraulic pump to a go-astern side, The change promotion position which drive operation of the hydraulic pump is carried out [position] at an advance side, and promotes a switch of the aforementioned neutral valve is prepared between the center valve positions for maintaining the aforementioned hydraulic motor to a idle state. It constitutes so that the aforementioned change promotion position may be made to pass since a go-astern operation region, and a gearshift lever may be switched to a center valve position and may be operated.
[0019] [Function] — the aforementioned 1st drain oil way and the 2nd drain oil way are connected to a motor from a pump at the drive oilway which carries out pressure-oil supply at the time of after ******, and expansion-ization of a neutral zone is attained For this reason, in case the climb of the airframe is carried out to a go-astern run, such as loading into a truck loading platform to an own strength run, when a run halt is carried out on the way, the operating physical force of the direction which a motor is made to rotate to the advance side for the airframe downward force may act, and the pump action to which a motor conveys oil towards the aforementioned drive oilway may be carried out. In this case, although the drive oilway remained being high pressure and cam-plate operating member switched to the neutral zone for the pump action of a motor when cam-plate operating member was operated so that it might switch from a go-astern region to a neutral zone directly, to closing, a neutral valve does not return, and opens

and there is a bird clapper with a state. On the other hand, a drive oilway is made to generate the failure of pressure, a neutral valve is closed, and after making it easy to switch to a state, cam-plate operating member operates by cam-plate operating member's going into an advance region from a go-astern region, making advance side rotation perform on a pump, and making the oil draw operation to a drive oilway perform by switching a gearshift lever from a go-astern operation region, making a promotion position pass, switching to a center valve position and operating it so that it may switch to a neutral zone. That is, even when stopping an airframe run in the state where a motor carries out a pump action to a drive oilway, a neutral valve is made easy to open and a run halt is carried out.

[0020] [Effect] — the case where a run halt of the airframe is carried out with the posture like the above, connecting the 1st drain oil way and the 2nd drain oil way to a motor from a pump at the drive oilway which carries out pressure-oil supply, and enabling it to use a pump output efficiently at the time of after ** — a neutral valve — opening — a state — switching — being easy — a latus neutral zone — securing — easy — a run halt — operation — it becomes to what has high reliability so that it may be easy

[0021]

[Embodiments of the Invention] As shown in drawing 1 , it runs by himself by the front wheels 1 and 1 and rear wheels 2 and 2 of a right-and-left couple which can be driven. At the posterior part of a run airframe which has the reserve ******** equipment 3 located in both the side side of a motor unit, the drawing marker 4, the steering handle 5 which carries out steering operation of the front wheel 1, the operation seat 6, etc. While connecting seedling plantation equipment 9 with dressing equipment so that rise-and-fall operation may be carried out through the link mechanism 8 by which rocking operation is carried out up and down by the hydraulic lift cylinder 7, it constitutes so that power transfer may be carried out through the axis of rotation 10 at seedling plantation equipment 9 from a run airframe, and the riding type rice planting machine is constituted. [0022] The gearbox 12 for a run is attached to the missions case 11 which forms the posterior part of the aforementioned run airframe. This gearbox 12 for a run is constituted by preparing hydraulic-pump P by which an input shaft is interlocked with the engine E located in the aforementioned motor unit, and hydraulic-motor M by which an output shaft is interlocked with the missions for a run (not shown) located in the interior of the aforementioned missions case 11 in the interior of the gearbox case connected with the aforementioned missions case 11. As shown in drawing 2 , while constituting the aforementioned hydraulic-motor M in an axial plunger type fixed delivery pump at the axial plunger type variable delivery pump from which, as for the aforementioned hydraulic-pump P, discharge quantity changes with angle change of a cam plate, respectively One side of the feeding-and-discarding section of the couple with which hydraulic-pump P is equipped is connected to one side of the feeding-and-discarding section of the couple with which the aforementioned hydraulic-motor M is equipped by the drive oilway 13, and the feeding-and-discarding section of another side of hydraulic-pump P is connected to the feeding-and-discarding section of another side of hydraulic-motor M by the drive oilway 14. That is, the aforementioned gearbox 12 for a run is constituted to the hydrostatic formula stepless gearbox, and Pump P drives it with Engine E, it is driven by the pressure oil to which Motor M is supplied through the drive oilways 13 and 14 from Pump P, and it is made to have transmitted the rotation force to the missions for a run. And by carrying out rocking operation of the cam-plate operating member 15 like drawing 3 which hydraulic-pump P has by the circumference of axis 15a, and changing a cam-plate angle, pressure-oil supply on Motor M is controlled from Pump P, and while switching the hand of cut of Motor M to an advance and go-astern side, the rotational speed by the side of the advance and go-astern is changed into a stepless story, or it has carried out that it seems that the drive is stopped.

[0023] As shown in drawing 2 , the 1st drain oil way 17 which has the neutral valve 16, and the 2nd drain-oil way 18 which has converging section 18a have been connected only to the drive oilway 14 of the direction which becomes the high-tension side from the drive oilway 13 of the direction which becomes Motor M from Pump P among the drive oilways 13 and 14 of the aforementioned couple the direction which carries out pressure-oil supply at the time of a go-astern side drive, and consists of a motor M the side which returns a pressure oil to Pump P

[0024] The aforementioned 2nd drain oil way 18 is the downstream of the supply oilway 19 which supplies an oil to the drive oilways 13 and 14 of a couple with the charge pump P1. Oilway partial 19a which has the check valve 20 which permits that an oil flows only to the direction of the drive oilway 14, While bypassing the aforementioned check valve 20, it has formed by drain oil way main part 18b which has the aforementioned converging section 18a, and the relief oilway 21 connected to the aforementioned supply oilway 19 so that the oil from the charge pump P1 may be returned to Tank T. Relief ** of the relief valve 22 which the aforementioned relief oilway 21 has is a low thing from relief ** of the relief valve 23 which secures the pressure which enables oil supply to the drive oilways 13 and 14 by the supply oilway 19, and acts on the drive oilway 13 or 14. Thereby, if the drive oilway 14 becomes higher than relief ** of a relief valve 22, the 2nd drain oil way 18 will be in an aperture state, and will discharge the pressure oil of the drive oilway 14 on Tank T by the flow rate decided by converging section 18a.
[0025] Aperture state 16a which the aforementioned neutral valve 16 makes open an upstream and a downstream for free passage rather than the neutral valve 16 of the 2nd drain oil way 17 and which is extracted and attached, While constituting from a neutral valve 16 of the 2nd drain oil way 17 free [a switch in the two state with closing state 16b which intercepts an upstream and a downstream] Rather than relief ** of the aforementioned relief valve 23, by low voltage, while being in a low pressure, the drive oilway 14 from relief ** of the aforementioned relief valve 22 [set pressure / which was set as high pressure / A] If switch operation is carried out and the drive oilway 14 is set to the aforementioned aperture state 16a automatically because of the energization force of the change spring 24 more than the aforementioned set pressure A It constitutes so that the aforementioned switch spring 24 may be resisted automatically because of the operation by the pilot oilway 25 which introduces pilot operating pressure from an upstream and switch operation may be carried out rather than the neutral valve 16 of the 1st drain oil way 17 at the aforementioned closing state 16b. If are in the aperture state while being in a low pressure from the aforementioned set pressure A set up so that, as for the 1st drain oil way 17, the drive oilway 14 might make large the neutral zone of the aforementioned cam-plate operating member 15 by this, and the pressure oil of the drive oilway 14 is made to flow into Tank T and the drive oilway 14 becomes more than the aforementioned set pressure A, it will switch to a closing state, and the pressure-oil outflow from the drive oilway 14 is made impossible.
[0026] If this operates the aforementioned cam-plate operating member 15 in the center valve position n shown in drawing 3 , hydraulic-pump P will stop the pressure-oil supply to the drive oilway 13, and the pressure-oil supply to the drive oilway 14, and hydraulic-motor M will carry out a rotation halt. If the pressure oil supplied from hydraulic-pump P increases, the advance rotational speed of hydraulic-motor M becomes quick and the cam-plate operating member 15 reaches to the actuated valve position Fmax of a stroke end so that hydraulic-pump P will supply a pressure oil to the drive oilway 13, hydraulic-motor M will rotate to an advance side and the operation stroke from the center valve position n of the cam-plate operating member 15 will be made into size, if rocking operation of the cam-plate operating member 15 is carried out in the rotation direction f from the aforementioned center valve position n, hydraulic-motor M will drive to an advance side On the other hand, if rocking operation of the cam-plate operating member 15 is carried out in the rotation direction r from the aforementioned center valve position n, although hydraulic-pump P will supply a pressure oil to the drive oilway 14 Until the cam-plate operating member 15 reaches an actuated valve position R0 The drive oilway 14 is low voltage from the aforementioned set pressure A, the neutral valve 16 opens, and it is in state 16a. Since the pressure oil is discharged by the 1st drain oil way 17 while the relief valve 22 has closed and there are few pressure oils supplied from hydraulic-pump P And since the pressure oil from hydraulic-pump P is discharged by the 1st drain oil way 17 and the 2nd drain oil way 18 after a relief valve 22 opens, hydraulic-motor M does not drive. If the cam-plate operating member 15 reaches an actuated valve position R0, the drive oilway 14 reaches the aforementioned set pressure A, the neutral valve 16 closes, and it switches to state 16b, and after this, although a part of pressure oil from hydraulic-pump P flows out of the 2nd drain oil way 18, the remaining oils will carry out a drive operation at hydraulic-motor M, and hydraulic-

motor M will rotate it to a go-astern side. And if the pressure oil which carries out a drive operation increases in hydraulic-motor M, the go-astern rotational speed of hydraulic-motor M becomes quick and the cam-plate operating member 15 reaches the actuated valve position Rmax of a stroke end so that the operation stroke from the aforementioned actuated valve position R0 of the cam-plate operating member 15 is made into size, hydraulic-motor M will drive to a go-astern side at top speed. By this, even if the actuated valve position of a between serves as a neutral zone N from the center valve position n and this center valve position n of the cam-plate operating member 15 to an actuated valve position R0 and hydraulic-pump P carries out pressure-oil supply in this neutral zone N, hydraulic-motor M does not drive, but the stepless gearbox 12 for a run will be in a neutral state as [carry out / power transfer / at the order rings 1 and 2]. And the operation region F of the slanting Itabe material 15 turns into an advance region, and while hydraulic-motor M drives to an advance side, it changes gears so that it may increase-slow down on a stepless story, and the stepless gearbox 12 for a run will be in an advance drive state in this advance region F as [transmit / change gears to a stepless story and / advance driving force / to the order rings 1 and 2]. On the other hand, the operation region R of the cam-plate operating member 15 turns into a go-astern region, and while hydraulic-motor M drives to a go-astern side, it changes gears so that it may increase-slow down on a stepless story, and the stepless gearbox 12 for a run will be in a go-astern drive state in this go-astern region R as [transmit / change gears to a stepless story and / go-astern driving force / to the order rings 1 and 2].

[0027] The oilway which is equipped only with converging section 18a without changing to the aforementioned 2nd drain oil way 18 where the aforementioned relief valve 22 exists and having an opening-and-closing function, as shown in drawing 6 , always opens, and is in a state may be adopted as the 2nd drain oil way 18, and may be carried out. In this case, if rocking operation of the cam-plate operating member 15 is carried out in the rotation direction r from the aforementioned center valve position n, although hydraulic-pump P will supply a pressure oil to the drive oilway 14 The drive oilway 14 is low voltage from the aforementioned set pressure A until the cam-plate operating member 15 reaches an actuated valve position R0, the neutral valve 16 opens, it is in state 16a, the pressure oil from hydraulic-pump P is discharged by the 1st drain oil way 17 and the 2nd drain oil way 18, and hydraulic-motor M does not drive. If the cam-plate operating member 15 reaches an actuated valve position R0, the drive oilway 14 reaches the aforementioned set pressure A, the neutral valve 16 closes, and it switches to state 16b, and after this, although a part of pressure oil from hydraulic-pump P flows out of the 2nd drain oil way 18, the remaining oils will carry out a drive operation at hydraulic-motor M, and hydraulic-motor M will rotate it to a go-astern side. And if the pressure oil which carries out a drive operation increases in hydraulic-motor M, the go-astern rotational speed of hydraulic-motor M becomes quick and the cam-plate operating member 15 reaches the actuated valve position Rmax of a stroke end so that the operation stroke from the aforementioned actuated valve position R0 of the cam-plate operating member 15 is made into size, hydraulic-motor M will drive to a go-astern side at top speed.

[0028] As shown in drawing 4 , in the electric cylinder 26 equipped with operating-member 26a connected with the aforementioned cam-plate operating member 15, and the electrical motor which carries out the slide drive of this operating-member 26a of this While it constitutes so that rocking operation of the cam-plate operating member 15 may be carried out and a cam-plate angle may be changed, and making the gear change controlling mechanism 28 coordinate with the electric cylinder 26 and the rotating type potentiometer 27 which detects the actuated valve position of the cam-plate operating member 15 the gearshift lever 30 coordinated with this gear change controlling mechanism 28 through a potentiometer 29 -- the side of a steering handle 5 -- the airframe sideways rotation pivot 31 located in the side is made to support, and the operation structure of the stepless gearbox 12 is constituted The boss section attached outside the aforementioned rotation pivot 31 while having the long hole of a gearshift lever 30 is connected free [rotation] by the circumference of the axis Y of the direction which intersects perpendicularly with the axis-of-rotation heart X of this to the rotation pivot 31, and it constitutes in the cross-joint rockable so that the incurvation guide slot of the lever guide 32

which shows a gearshift lever 30 to drawing 5 may be made to meet and rocking operation can be carried out. If a gearshift lever 30 rocks by the circumference of Axis X, it constitutes so that the interlocking arm 33 which extends really free [rotation] from the aforementioned rotation pivot 31 may have coordinated with operation arm 29a which can rock the aforementioned potentiometer 29 and an operating physical force may be transmitted, and it constitutes so that a potentiometer 29 may detect the actuated valve position of a gearshift lever 30 and may output the detection result to the gear change controlling mechanism 28. By making the electrical motor of the electric cylinder 26 drive, or outputting the signal to stop based on the detection result by potentiometers 27 and 28, the gear change controlling mechanism 28 is constituted so that operation of locating the cam-plate operating member 15 in the actuated valve position corresponding to the actuated valve position of a gearshift lever 30 may be made to perform in the electric cylinder 26.

[0029] That is, a gearshift lever 30 is made for there to be along the guide slot of a lever guide 32, rocking operation is carried out, if it is operated in the center valve position N1 located in the center section of the guide slot, the gear change controlling mechanism 28 will control an electrical motor in a run halt position based on the information from potentiometers 27 and 29, and the electric cylinder 26 will operate the cam-plate operating member 15 to the aforementioned neutral zone N. By this, the stepless gearbox 12 for a run is operated in the neutral state, the drive of the order rings 1 and 2 is stopped, and an airframe run is stopped. If a gearshift lever 30 is operated in the advance operation region F1 located in the end side of a guide slot, the gear change controlling mechanism 28 will control an electrical motor to an advance side based on the information from potentiometers 27 and 29, and the electric cylinder 26 will operate the cam-plate operating member 15 in the position corresponding to the actuated valve position of a gearshift lever 30 in the aforementioned advance region F. By this, it is an advance side, and the stepless gearbox 12 for a run is operated in the drive state of the speed corresponding to a gearshift lever position, and is driven to the advance side by the order rings 1 and 2, and the advance run of the airframe is carried out. If a gearshift lever 30 is operated in the go-astern operation region R1 located in the other end side of a guide slot, the gear change controlling mechanism 28 will control an electrical motor to a go-astern side based on the information from potentiometers 27 and 29, and the electric cylinder 26 will operate the cam-plate operating member 15 in the position corresponding to the actuated valve position of a gearshift lever 30 in the aforementioned go-astern region R. By this, it is a go-astern side, and the stepless gearbox 12 for a run is operated in the drive state of the speed corresponding to a gearshift lever position, and is driven to the go-astern side by the order rings 1 and 2, and the go-astern run of the airframe is carried out.

[0030] Positioning section 32a to the gearshift lever 30 operated in the aforementioned center valve position N1 located in the end side of the advance operation region F1 as shown in drawing 5 , and the aforementioned center valve position N1, By making a lever guide 32 equipped with each of guide projected part 32b located between the center valve positions N2 located in the end side of the go-astern operation region R1, the aforementioned go-astern operation region R1, and the advance operation region F2 in which it is located together with the shape of a straight line While making the aforementioned center valve position N1 into the center valve position for maintaining hydraulic-motor M to a idle state and considering as the change promotion position F2 for opening the aforementioned advance operation region F2 from closing state 16a of the aforementioned neutral valve 16, and promoting the switch to state 16b Switch the gearshift lever 30 operated in the go-astern operation region R1, and it makes the promotion position F2 pass, and it is constituted so that a center valve position N1 may be made to carry out switch operation.

[0031] that is, although the cam-plate operating member 15 becomes the aforementioned halt region N and can operate hydraulic-motor M to a idle state even if it operates a gearshift lever 30 to any of the aforementioned center valve positions N1 and N2, if it is in the direction of a center valve position N2, it is hard to hold a gearshift lever 30 in the position N2, and if it is in the direction of a center valve position N1, a gearshift lever 30 is twisted to the aforementioned positioning section 32a or guide projected part 32b -- catching -- it can Thereby, in the case of

a run halt, a gearshift lever 30 is operated in a center valve position N1, and a idle state is made to maintain hydraulic-motor M. And in order to bypass guide projected part 32b from the go-astern operation region R1, to switch a gearshift lever 30 to a center valve position N1, to operate it and to carry out a run halt at the time of go-astern, it switches from the go-astern operation region R1, it switches to the promotion position F2 at once, and is operated, and a gearshift lever 30 is switched to a center valve position N1 after this, and is operated. And if a gearshift lever 30 is switched from the go-astern operation region R1, is switched to the promotion position F2 and operated, the cam-plate operating member 15 switches from the go-astern region R to the advance region F, and hydraulic-pump P will switch to the drive by the side of [a go-astern side to] advance, and will operate it. Then, only by having only switched hydraulic-pump P to the idle state, and operating it from a go-astern drive It is hard to carry out the failure of pressure of the drive oilway 14 by the operating physical force which hydraulic-motor M is made to rotate to an advance side acting etc. When the neutral valve 16 closes, it opens from state 16b, and it is hard to switch to state 16a, and hydraulic-pump P drives to an advance side and carries out an oil-removing operation at the drive oilway 14 It is made easy for the pressure of the drive oilway 14 to make it fall, to close the neutral valve 16, to open from state 16b, and to switch to state 16a. That is, in case a gearshift lever 30 is operated in a center valve position N1 and a run halt is carried out, the neutral valve 16 is opened, and it is made easy to switch to state 16a, and is stopped.

[0032] it is shown in drawing 7 — as — the drawing markers 4 and 4 of the aforementioned right-and-left couple — each End face side marker partial 4a which a end face side connects with the supporter material 34 of fixation on a run airframe free [rotation] by the circumference of the axis of the airframe vertical direction, Nose-of-cam side marker partial 4b which a end face side connects with the nose-of-cam side of this end face side marker partial 4a free [rotation] by the circumference of a horizontal axis, While drawing lever 4c which extends from the nose-of-cam side of this nose-of-cam side marker partial 4b constitutes and carrying out rocking operation of the end face side marker partial 4a to the supporter material 34 By carrying out rocking operation up and down to end face side marker partial 4a, nose-of-cam side marker partial 4b at the time of work As shown in drawing 1 , it is switched to the use posture which the nose-of-cam side of drawing lever 4c grounds to a field, and carries out a drawing operation, and it is made to be switched into the storing posture in which nose-of-cam side marker partial 4b becomes the airframe vertical sense near the anterior of reserve ******** equipment 3 as shown in drawing 7 , at the time of un-working. That is, it will become a use posture if nose-of-cam side marker partial 4b is made into the installation posture which extends together with the shape of about 1 straight line toward an airframe horizontal outside from end face side marker partial 4a with the installation posture which extends end face side marker partial 4a toward an airframe horizontal outside from the supporter material 34. And it will become a storing posture if nose-of-cam side marker partial 4b is made into the installation posture which extends from end face side marker partial 4a to the airframe upper part sense near the anterior of reserve ******** equipment 3 with the installation posture which extends end face side marker partial 4a from the supporter material 34 along with an airframe cross direction to the airframe front sense. When the drawing marker 4 is stored, the drawing marker 4 is projected and bent by run vibration etc., and it is made to have held into the storing posture like by making hook section 35a by the side of the nose of cam of the support lever 35 which extends from ******** support 3a of reserve ******** equipment 3 stop the nose-of-cam side of nose-of-cam side marker partial 4b. Although ******** 3b is in the state where the corner of the mat-like seedling 36 comes outside from ********3b when the mat-like seedling 36 is laid in ******** 3b of reserve ******** equipment 3 as shown in drawing 8 Even when the mat-like seedling 36 is laid in ******** 3b, the support lever 35 is formed so that the aforementioned hook section 35a may be located outside the mat-like seedling 36 and can hang nose-of-cam side marker partial 4b.

[0033] The aforementioned seedling plantation equipment 9 is constituted so that it can divide into the seedling plantation equipment portion of the right-and-left couple which each equips with two or more seedling plantation mechanism 9a or one division ****** rest part 9b. By changing the connection posture over the link mechanism 8 of each division seedling plantation

equipment portion, at the time of work As shown in drawing 1 , while seedling plantation mechanism 9a of each division seedling plantation equipment portion is located in a line with the longitudinal direction of a run airframe It is switched to the posture for work which both the division seedling plantation equipment portion connects with a link mechanism 8 together with an airframe longitudinal direction so that division ****** rest part 9b of both the division seedling plantation equipment portion may become ******** of one sheet together with the longitudinal direction of a run airframe. At the time of un-working [which it makes it carry out a move run, or puts an airframe on a truck] As shown in drawing 9 , while seedling plantation mechanism 9a of each division seedling plantation equipment portion is located in a line with the cross direction of a run airframe It is made to be switched at the storing posture raised and supported with the folding posture which both the division seedling plantation equipment portion connects with a link mechanism 8 together with an airframe longitudinal direction so that the direction of breadth of division ****** rest part 9b of both the division seedling plantation equipment portion may become the run airframe order sense. When seedling plantation equipment 9 is made into the aforementioned storing posture, a lift cylinder 7 is equipped with a stopper 37, downward prevention of seedling plantation equipment 9 is aimed at, and this stopper 37 is constituted as shown in drawing 10 or drawing 12 .

[0034] It equips between the spring receptacle implement 39 which it has so that cylinder rod 7a of a lift cylinder 7 may catch and support the cushion spring 38, and cylinder-tube 7b of a lift cylinder 7, and the stopper 37 which shows any of drawing 10 and drawing 12 is also constituted so that it may be stubborn to cylinder rod 7a and it may be made to support. That is, it has prevented that the weight of seedling plantation equipment 9 etc. is applied to a lift cylinder 7, an oil spillage occurs in the control valve of a lift cylinder 7, and a lift cylinder 7 is shortened.

[0035] a part of member which forms the handle 42 which it has for attachment-and-detachment operation of a stopper 37 when in the case of the stopper 37 which shows drawing 10 the **** stopper electrode holder 41 shown in the covering 40 for the aforementioned cushion spring 38 which SHIRIDA rod 7a holds at drawing 11 is made to support and a lift cylinder 7 is equipped with a stopper 37 — it is made have inserted in, making the catch section of the stopper electrode holder 41 carry out elastic deformation of this for 42a That is, a handle 42 is made to carry out the maintenance operation of the stopper electrode holder 41, and prevention of a stopper 37 separating from a lift cylinder 7 is aimed at.

[0036] In the case of the stopper 37 which shows drawing 12 , to the covering 40 for the aforementioned cushion spring 38 which cylinder rod 7a holds When the stopper electrode holder 43 which has **** stopper pin 43a shown in drawing 13 is attached and a lift cylinder 7 is equipped with a stopper 37, by operation arm 43b which extends from stopper pin 43a the pieces 44 and 44 of projection of the couple to which is pin electrode-holder 43c received and slide operation of the stopper pin 43a is carried out in a stopper's 37 direction and which a stopper 37 equips with the nose-of-cam side of stopper pin 43a — each pin — it inserts in a hole, projects and is made to have stopped the piece 44 That is, a stopper 37 is made to do the stop operation of the stopper pin 43a of the stopper electrode holder 43, and prevention of a stopper 37 separating from a lift cylinder 7 is aimed at.

[0037] It may change to the aforementioned electric cylinder 26, an oil hydraulic cylinder etc. may be adopted and carried out, these are named generically, and an actuator is called.

[0038] The stepless gearbox for a run by this invention is applicable also to the gearbox with which various work vehicles, such as a farm tractor besides a rice planting machine, a lawn mower, and a combined harvester and thresher, are equipped.

[Translation done.]

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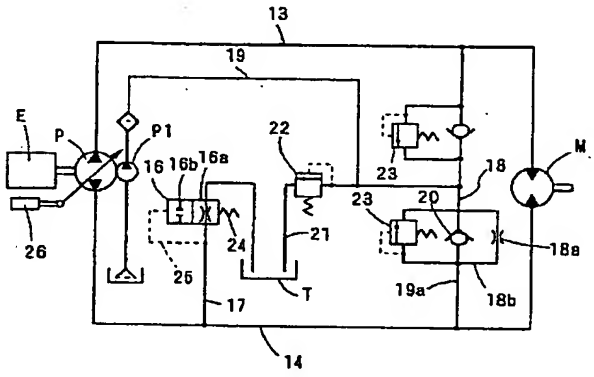
(54)【発明の名称】　走行用静油圧式無段変速装置

(57)【要約】

【課題】　駆動ロスを少なく抑制しながら斜板操作部材の中立域を広くできる走行用静油圧式無段変速装置を提供する。

【解決手段】　油圧ポンプＰと油圧モータＭとを接続する駆動油路１４に、中立弁１６を有する第１排油路１７と、絞り部１８ａを有する第２排油路１８とを接続してある。駆動油路１４がリリーフ弁２２のリリーフ圧より高圧に設定の設定圧より低圧である間は、中立弁１６が開き状態１６ａにあり、駆動油路１４の圧油が第１排油路１７と第２排油路１８とによって排出されて油圧モータＭが停止する。駆動油路１４が前記設定圧以上になると、中立弁１６が閉じ状態１６ｂに切り換わり、駆動油路１４の圧油は一部が第２排油路１８によって排出されながら油圧モータＭを駆動する。



【特許請求の範囲】
【請求項１】　可変容量型の油圧ポンプと、油圧モータとで成る走行用静油圧式無段変速装置であって、
前記油圧ポンプと前記油圧モータとを接続する駆動油路が設定圧以上になれば自動的に閉じ状態に切り換わり、前記駆動油路が設定圧より小圧になれば自動的に開き状態に切り換わる中立弁を有する第１排油路と、絞り部を有する第２排油路とを前記駆動油路に接続してある走行用静油圧式無段変速装置。
【請求項２】　前記油圧ポンプの斜板角をアクチュエータによって変更操作するように構成してある請求項１記載の走行用静油圧式無段変速装置。
【請求項３】　前記油圧ポンプと前記油圧モータとを接続する一対の駆動油路のうちの後進側駆動時に高圧側になる駆動油路にのみ前記第１排油路と前記第２排油路とを接続してある請求項１又は２記載の走行用静油圧式無段変速装置。
【請求項４】　前記油圧ポンプの斜板角を変更する変速レバーを備え、前記油圧ポンプを後進側に駆動するための後進操作域と、前記油圧モータを停止状態に維持するための中立位置との間に、油圧ポンプを前進側に駆動操作して前記中立弁の切り換えを促進させる切換え促進位置を設けて、変速レバーを後進操作域から前記切換え促進位置を経過させて中立位置に切り換え操作するように構成してある請求項３記載の走行用静油圧式無段変速装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、可変容量型の油圧ポンプと、油圧モータとで成る走行用静油圧式無段変速装置に関する。
【０００２】
【従来の技術】上記無段変速装置において、従来、たとえば特開昭６２－１３２０６６号公報に示されるように、油圧ポンプと油圧モータを接続する駆動油路に、中立弁としてのパイロット式開閉弁を有する排油路を接続し、油圧ポンプを中立状態から高速側に操作しても、駆動油路が小圧にある間は、開閉弁が開き状態になっていて油圧ポンプからの圧油を排出するために油圧モータが駆動されず、駆動油路が高圧になれば、開閉弁が自動的に閉じ状態に切り換わって油圧モータへの圧油供給を可能にするために油圧モータが駆動されるものがあった。これは、油圧ポンプの斜板操作部材を、油圧ポンプが圧油供給を停止する操作位置に操作した場合のみならず、この操作位置から少し離れて油圧ポンプが低圧で圧油供給する操作位置に操作した場合にも、油圧モータが回動しなくて無段変速装置としては出力停止する中立状態に制御できるようになったものである。すなわち、斜板操作部材の中立域を、油圧ポンプが圧油供給を停止するだけのものよりも広く形成できるようになったものである。
【０００３】
【発明が解決しようとする課題】たとえば、油圧ポンプの斜板操作部材を電動シリンダなどのアクチュエータで操作して変速操作する場合、斜板操作部材の中立域が広いほど、アクチュエータが停止信号を受信した際に少し動き過ぎてから停止することがあっても、斜板操作部材を中立域にこれから出ないように停止させやすくて有利に変速操作できる。ところが、上記した従来の中立域拡大技術の場合、中立弁を開き状態から閉じ状態に切り換わる際の駆動油路の圧力が中立域の広さの割りには高くなっていた。この結果、機体走行を開始させる際には駆動油路の圧力が高圧まで上昇してからモータが動き始めて機体が急に発進し、機体走行を停止させる際には駆動油路の圧力が充分に低下しないうちにモータが停止して機体走行が急に停止するというトラブルが発生していた。本発明の目的は、上記トラブルを回避しながら、かつ、出力ロスを極力少なく済ませながら中立域を広くできる無段変速装置を提供することにある。
【０００４】
【課題を解決するための手段】請求項１による発明の構成、作用、効果はつぎのとおりである。
【０００５】〔構成〕可変容量型の油圧ポンプと、油圧モータとで成る走行用静油圧式無段変速装置において、前記油圧ポンプと前記油圧モータとを接続する駆動油路が設定圧以上になれば自動的に閉じ状態に切り換わり、前記駆動油路が設定圧より小圧になれば自動的に開き状態に切り換わる中立弁を有する第１排油路と、絞り部を有する第２排油路とを前記駆動油路に接続してある。
【０００６】〔作用〕油圧ポンプの斜板操作部材をポンプの圧油供給を停止させる操作位置から移動させてポンプが圧油供給を行うことになっても、駆動油路が設定圧に達するまでは、中立弁が開き状態にあり、ポンプからの圧油は第１排油路と第２排油路の両排油路から排出されて油圧モータを駆動せず、無段変速装置は中立状態にある。斜板操作部材をさらに移動させて駆動油路が設定圧に達すると、この後は、中立弁が閉じ状態に切り換わり、ポンプからの圧油の一部が第２排油路から排出され、残りの油が油圧モータを駆動し、無段変速装置は駆動状態になる。このため、斜板操作部材の中立域は、油圧ポンプが圧油供給を停止する操作位置と、油圧ポンプが圧油供給をしても圧油が低圧で第１排油路と第２排油路から流出する操作位置とからなる広いものになる。そして、油路圧上昇に伴って排油作用を停止する第１排油路と、油路圧上昇後にも排油作用を行う第２排油路との両排油路による排油によって中立域を拡大するものだから、油路圧上昇に伴って排油作用を停止する排油路のみを採用していた従来に比し、中立弁が開きから閉じに切り換わる際の駆動油路の前記設定圧を低い圧力に設定しながら、中立域を同一広さのものに拡大化できる。

【０００７】油路圧上昇によって排油作用を停止する排油路を備えないで、油路圧が上昇した後にも排油作用を行う排油路のみを備えても、中立域を拡大化できる。すなわち、油圧ポンプの斜板操作部材をポンプの圧油供給を停止させる操作位置から移動させてポンプが圧油供給をすることになっても、ポンプからの圧油の全量が排油路から流出する間は、油圧モータが駆動されず、無段変速装置は中立状態にある。斜板操作部材をさらに移動させてポンプからの圧油の一部が排油路から排出され、残りの圧油が油圧モータに作用するようになれば、油圧モータが駆動され、無段変速装置は駆動状態になるのである。この場合、第１排油路と第２排油路との両排油路を備える本発明と比較すると、同一広さの中立域を確保するに当たり、油圧モータが駆動される際に排油路から流出する圧油が多くなり、モータの駆動に利用できるポンプ出力の割合が低下する。

【０００８】〔効果〕斜板操作部材の中立域を広く形成し、人為操作の場合には、斜板操作部材を中立域にこれから外れないように操作しやすくて走行停止を現出しやすいように変速操作でき、アクチュエータ操作の場合には、アクチュエータが停止信号を受信した際に少し動き過ぎてから停止するということがあっても、斜板操作部材を中立域にこれから出ないように停止させやすくて走行停止を現出しやすいように変速操作できるものにできた。しかも、中立域の広さの割りには低い駆動油路圧で中立弁が切り換わるとともにポンプによるモータ駆動が効率よく行われて出力を極力無駄なく利用して高速走行できるように、かつ、発進や停止衝撃が少なくて快適に走行できるように走行性の高いものにできた。

【０００９】請求項２による発明の構成、作用、効果はつぎのとおりである。

【００１０】〔構成〕請求項１による発明の構成において、前記油圧ポンプの斜板角をアクチュエータによって変更操作するように構成してある。

【００１１】〔作用〕アクチュエータを作動させることにより、アクチュータの駆動力によって斜板角を変更して変速できるものである。そして、斜板操作部材の中立域を広く形成できるものであることから、アクチュエータが停止信号を受信した際に少し動き過ぎてから停止することがあっても、斜板操作部材を中立域にこれから外れないように停止させやすい状態で変速操作できる。

【００１２】〔効果〕軽く変速操作できるとともに制御精度があまり高くなくても走行停止を確実に現出できるように操作性及び信頼性の面で優れたものになる。

【００１３】請求項３による発明の構成、作用、効果はつぎのとおりである。

【００１４】〔構成〕請求項１又は２による発明の構成において、前記油圧ポンプと前記油圧モータとを接続する一対の駆動油路のうちの後進側駆動時に高圧側になる駆動油路にのみ前記第１排油路と前記第２排油路とを接続してある。

【００１５】〔作用〕ポンプとモータを接続する一対の駆動油路のいずれにも第１排油路と第２排油路を接続した場合、前進時と後進時のいずれにおいてもポンプからの圧油の一部を第２排油路から流出させながらモータを駆動することになる。これに対し、請求項３による構成の場合、後進時にはポンプからの圧油の一部を第２排油路から流出させながらモータを駆動することになるが、前進時にはポンプからの圧油の全量によってモータを駆動することになる。すなわち、前者の場合、前進時にも後進時にもポンプ出力の一部を損失する状態で中立域を拡大化することになるのに対し、請求項３による構成の場合、前進時にはポンプ出力を損失しない状態で中立域を拡大化することになる。

【００１６】〔効果〕前進時にはポンプからの圧油の全量によってモータを駆動できることと、一般には後進走行よりも前進走行の方が頻繁に行われることにより、全体としては、ポンプ出力の損失を少なく済ませながら中立域を広くし、走行停止を操作容易に現出しやすいものを、ポンプ出力を効率よく利用して走行できるとともに極力高速前進できる状態に得られる。

【００１７】請求項４による発明の構成、作用、効果はつぎのとおりである。

【００１８】〔構成〕請求項３による本発明の構成において、前記油圧ポンプの斜板角を変更する変速レバーを備え、前記油圧ポンプを後進側に駆動するための後進操作域と、前記油圧モータを停止状態に維持するための中立位置との間に、油圧ポンプを前進側に駆動操作して前記中立弁の切り換えを促進させる切換え促進位置を設けて、変速レバーを後進操作域から前記切換え促進位置を経過させて中立位置に切り換え操作するように構成してある。

【００１９】〔作用〕後進走行時にポンプからモータに圧油供給する駆動油路に前記第１排油路と第２排油路とを接続して中立域の拡大化を図るものである。このため、機体を運搬車荷台に自力走行で積み込むなど後進走行で登坂させる際、途中で走行停止させると、モータには機体下降力のために前進側に回動させる方向の操作力が作用し、モータが前記駆動油路に向けて送油するポンプ作用をすることがある。この場合、斜板操作部材を後進域から中立域に直接に切り換わるように操作すると、モータのポンプ作用のために駆動油路が高圧のままになり、斜板操作部材が中立域に切り換わったにもかかわらず、中立弁が閉じに戻らなくて開き状態のままになることがある。これに対し、変速レバーを後進操作域から切り換え促進位置を経過させて中立位置に切り換え操作することにより、斜板操作部材が後進域から前進域に入り、ポンプに前進側回動を行わせて駆動油路に対する油抜き出し作用を行わせることにより、駆動油路に圧力低下を発生させて中立弁を閉じ状態に切り換わりやすくし

てから中立域に切り換わるように斜板操作部材を操作するものである。すなわち、モータが駆動油路にポンプ作用する状態で機体走行を停止させる場合でも、中立弁を開きやすくして走行停止させるものである。

【００２０】〔効果〕後進時にポンプからモータに圧油供給する駆動油路に第１排油路と第２排油路とを接続してポンプ出力を効率よく利用できるようにするものでありながら、機体を前記の如き姿勢で走行停止させる場合でも中立弁が開き状態に切り換わりやすくて広い中立域が確保しやすく、走行停止を操作容易かつ確実に現出しやすいように信頼性の高いものになる。

【００２１】

【発明の実施の形態】図１に示すように、左右一対の駆動自在な前車輪１，１と後車輪２，２とによって自走し、原動部の両横側に位置する予備苗載せ台装置３と線引きマーカー４、前車輪１を操向操作するステアリングハンドル５、運転座席６などを有する走行機体の後部に、油圧式リフトシリンダ７によって上下に揺動操作されるリンク機構８を介して昇降操作するように施肥装置付き苗植付装置９を連結するとともに、走行機体から回転軸１０を介して苗植付装置９に動力伝達するように構成して、乗用型田植機を構成してある。

【００２２】前記走行機体の後部を形成するミッションケース１１に走行用変速装置１２を付設してある。この走行用変速装置１２は、前記原動部に位置するエンジンＥに入力軸が連動する油圧ポンプＰと、前記ミッションケース１１の内部に位置する走行用ミッション（図示せず）に出力軸が連動する油圧モータＭとを前記ミッションケース１１に連結する変速装置ケースの内部に設けることによって構成してある。図２に示すように、前記油圧ポンプＰは斜板の角度変更によって吐出量が変化するアキシャルプランジャ型の可変容量形ポンプに、前記油圧モータＭはアキシャルプランジャ型の定容量形ポンプにそれぞれ構成するとともに、油圧ポンプＰが備える一対の給排部の一方は、前記油圧モータＭが備える一対の給排部の一方に駆動油路１３によって接続し、油圧ポンプＰの他方の給排部は、油圧モータＭの他方の給排部に駆動油路１４によって接続してある。すなわち、前記走行用変速装置１２は静油圧式無段変速装置に構成してあり、ポンプＰがエンジンＥによって駆動され、モータＭがポンプＰから駆動油路１３，１４を介して供給される圧油で駆動されてその回動力を走行用ミッションに伝達するようにしてある。そして、油圧ポンプＰが有する図３の如き斜板操作部材１５を軸芯１５ａまわりで揺動操作して斜板角を変更することにより、ポンプＰからモータＭへの圧油供給を制御し、モータＭの回転方向を前進側と後進側とに切り換えるとともにその前進側および後進側での回転速度を無段階に変更したり、その駆動を停止させたりするようにしてある。

【００２３】図２に示すように、前記一対の駆動油路１３，１４のうち、後進側駆動時にポンプＰからモータＭに圧油供給する方となり、モータＭからポンプＰに圧油を戻す側となる方の駆動油路１３よりも高圧側になる方の駆動油路１４にのみ、中立弁１６を有する第１排油路１７と、絞り部１８ａを有する第２排油路１８とを接続してある。

【００２４】前記第２排油路１８は、チャージポンプＰ１によって一対の駆動油路１３，１４に油を補給する補給油路１９の下流側で、油が駆動油路１４の方にのみ流れることを許容するチェック弁２０を有する油路部分１９ａと、前記チェック弁２０を迂回するとともに前記絞り部１８ａを有する排油路本体１８ｂと、チャージポンプＰ１からの油をタンクＴに戻すように前記補給油路１９に接続するリリーフ油路２１とによって形成してある。前記リリーフ油路２１が有するリリーフ弁２２のリリーフ圧は、補給油路１９による駆動油路１３，１４への油補給を可能にする圧力を確保するもので、駆動油路１３や１４に作用するリリーフ弁２３のリリーフ圧より低いものである。これにより、第２排油路１８は、駆動油路１４がリリーフ弁２２のリリーフ圧より高くなれば、開き状態になって駆動油路１４の圧油を絞り部１８ａによって決まる流量でタンクＴに排出する。

【００２５】前記中立弁１６は、第２排油路１７の中立弁１６よりも上流側と下流側とを連通させる絞り付きの開き状態１６ａと、第２排油路１７の中立弁１６よりも上流側と下流側とを遮断する閉じ状態１６ｂとの二状態に切り換え自在に構成するとともに、駆動油路１４が前記リリーフ弁２３のリリーフ圧よりも低圧で前記リリーフ弁２２のリリーフ圧よりも高圧に設定した設定圧Ａよりも低い圧力にある間は、切換えばね２４の付勢力のために自動的に前記開き状態１６ａに切り換え操作されており、駆動油路１４が前記設定圧Ａ以上になると、第１排油路１７の中立弁１６よりも上流側からパイロット操作圧を導入するパイロット油路２５による作用のために自動的に前記切り換えばね２４に抗して前記閉じ状態１６ｂに切り換え操作されるように構成してある。これにより、第１排油路１７は、駆動油路１４が前記斜板操作部材１５の中立域を広くするように設定した前記設定圧Ａより低い圧力にある間は開き状態になっていて駆動油路１４の圧油をタンクＴに流出させ、駆動油路１４が前記設定圧Ａ以上になると、閉じ状態に切り換わって駆動油路１４からの圧油流出を不能にする。

【００２６】これにより、前記斜板操作部材１５を図３に示す中立位置ｎに操作すると、油圧ポンプＰが駆動油路１３に対する圧油供給も駆動油路１４に対する圧油供給も停止し、油圧モータＭが回動停止する。斜板操作部材１５を前記中立位置ｎから回動方向ｆに揺動操作すると、油圧ポンプＰが駆動油路１３に圧油を供給して油圧モータＭが前進側に回動し、斜板操作部材１５の中立位置ｎからの操作ストロークを大にするほど、油圧ポンプ

Ｐから供給される圧油が多くなって油圧モータＭの前進回転速度が速くなり、斜板操作部材１５がストロークエンドの操作位置Ｆｍａｘに達すると油圧モータＭが前進側に最高速度で駆動される。これに対し、斜板操作部材１５を前記中立位置ｎから回動方向ｒに揺動操作すると、油圧ポンプＰが駆動油路１４に圧油を供給するが、斜板操作部材１５が操作位置Ｒ０に達するまでの間は、駆動油路１４が前記設定圧Ａより低圧になっていて中立弁１６が開き状態１６ａにあり、リリーフ弁２２が閉じている間は油圧ポンプＰから供給される圧油が少ないとともにその圧油が第１排油路１７によって排出されるために、そして、リリーフ弁２２が開いてからは油圧ポンプＰからの圧油が第１排油路１７と第２排油路１８とによって排出されるために油圧モータＭが駆動されない。斜板操作部材１５が操作位置Ｒ０に達すると、駆動油路１４が前記設定圧Ａに達して中立弁１６が閉じ状態１６ｂに切り換わり、この後は、油圧ポンプＰからの圧油の一部は第２排油路１８から流出するが残りの油が油圧モータＭに駆動作用して油圧モータＭが後進側に回動する。そして、斜板操作部材１５の前記操作位置Ｒ０からの操作ストロークを大にするほど、油圧モータＭに駆動作用する圧油が多くなって油圧モータＭの後進回転速度が速くなり、斜板操作部材１５がストロークエンドの操作位置Ｒｍａｘに達すると油圧モータＭが後進側に最高速度で駆動される。これにより、斜板操作部材１５の中立位置ｎと、この中立位置ｎから操作位置Ｒ０まで間の操作位置が中立域Ｎとなり、この中立域Ｎでは、油圧ポンプＰが圧油供給をしても油圧モータＭは駆動されず、走行用無段変速装置１２は前後輪１，２に動力伝達しないように中立状態になる。そして、斜板部材１５の操作域Ｆが前進域となり、この前進域Ｆでは、油圧モータＭが前進側に駆動されるとともに無段階に増減速するように変速され、走行用無段変速装置１２は前後輪１，２に前進駆動力を無段階に変速して伝達するように前進駆動状態になる。これに対し、斜板操作部材１５の操作域Ｒが後進域となり、この後進域Ｒでは、油圧モータＭが後進側に駆動されるとともに無段階に増減速するように変速され、走行用無段変速装置１２は前後輪１，２に後進駆動力を無段階に変速して伝達するように後進駆動状態になる。

【００２７】図６に示すように、前記リリーフ弁２２が存在する前記第２排油路１８に替え、開閉機能を備えないで絞り部１８ａのみを備えて常に開き状態にある油路を第２排油路１８として採用して実施してもよい。この場合、斜板操作部材１５を前記中立位置ｎから回動方向ｒに揺動操作すると、油圧ポンプＰが駆動油路１４に圧油を供給するが、斜板操作部材１５が操作位置Ｒ０に達するまでの間は、駆動油路１４が前記設定圧Ａより低圧になっていて中立弁１６が開き状態１６ａにあり、油圧ポンプＰからの圧油が第１排油路１７と第２排油路１８とによって排出されて油圧モータＭが駆動されない。斜板操作部材１５が操作位置Ｒ０に達すると、駆動油路１４が前記設定圧Ａに達して中立弁１６が閉じ状態１６ｂに切り換わり、この後は、油圧ポンプＰからの圧油の一部は第２排油路１８から流出するが残りの油が油圧モータＭに駆動作用して油圧モータＭが後進側に回動する。そして、斜板操作部材１５の前記操作位置Ｒ０からの操作ストロークを大にするほど、油圧モータＭに駆動作用する圧油が多くなって油圧モータＭの後進回転速度が速くなり、斜板操作部材１５がストロークエンドの操作位置Ｒｍａｘに達すると油圧モータＭが後進側に最高速度で駆動される。

【００２８】図４に示すように、前記斜板操作部材１５に連結する操作部材２６ａと、このこの操作部材２６ａをスライド駆動する電動モータとを備える電動シリンダ２６により、斜板操作部材１５を揺動操作して斜板角を変更するように構成し、電動シリンダ２６と、斜板操作部材１５の操作位置を検出する回転式ポテンショメータ２７とに変速制御機構２８を連係させるとともに、この変速制御機構２８にポテンショメータ２９を介して連係する変速レバー３０を、ステアリングハンドル５の横側方に位置する機体横向きの回転支軸３１に支持させて、無段変速装置１２の操作構造を構成してある。変速レバー３０の長孔を有するとともに前記回転支軸３１に外嵌するボス部を、回転支軸３１に対してこれの回転軸芯Ｘと直交する方向の軸芯Ｙまわりで回転自在に連結し、変速レバー３０を図５に示すレバーガイド３２の屈曲ガイド溝に沿わせて揺動操作できるように十字揺動可能に構成してある。変速レバー３０が軸芯Ｘまわりで揺動すると、前記回転支軸３１から一体回転自在に延出する連動アーム３３が前記ポテンショメータ２９の揺動自在な操作アーム２９ａに連係していて操作力を伝達するように構成し、ポテンショメータ２９が変速レバー３０の操作位置を検出してその検出結果を変速制御機構２８に出力するように構成してある。変速制御機構２８は、ポテンショメータ２７と２８とによる検出結果に基づいて電動シリンダ２６の電動モータを駆動させたり、停止させたりする信号を出力することにより、斜板操作部材１５を変速レバー３０の操作位置に対応する操作位置に位置させる操作を電動シリンダ２６に行わせるように構成してある。

【００２９】つまり、変速レバー３０をレバーガイド３２のガイド溝に沿わせて揺動操作し、ガイド溝の中央部に位置する中立位置Ｎ１に操作すると、変速制御機構２８がポテンショメータ２７と２９からの情報に基づいて電動モータを走行停止位置に制御し、電動シリンダ２６が斜板操作部材１５を前記中立域Ｎに操作する。これにより、走行用無段変速装置１２を中立状態に操作して前後輪１，２の駆動を停止させ、機体走行を停止させられる。変速レバー３０をガイド溝の一端側に位置する前進

操作域Ｆ１に操作すると、変速制御機構２８がポテンショメータ２７と２９からの情報に基づいて電動モータを前進側に制御し、電動シリンダ２６が斜板操作部材１５を前記前進域Ｆで変速レバー３０の操作位置に対応する位置に操作する。これにより、走行用無段変速装置１２を前進側で変速レバー位置に対応する速度の駆動状態に操作して前後輪１，２を前進側に駆動し、機体を前進走行させられる。変速レバー３０をガイド溝の他端側に位置する後進操作域Ｒ１に操作すると、変速制御機構２８がポテンショメータ２７と２９からの情報に基づいて電動モータを後進側に制御し、電動シリンダ２６が斜板操作部材１５を前記後進域Ｒで変速レバー３０の操作位置に対応する位置に操作する。これにより、走行用無段変速装置１２を後進側で変速レバー位置に対応する速度の駆動状態に操作して前後輪１，２を後進側に駆動し、機体を後進走行させられる。

【００３０】図５に示すように、前進操作域Ｆ１の一端側に位置する前記中立位置Ｎ１に操作された変速レバー３０に対する位置決め部３２ａ、前記中立位置Ｎ１と、後進操作域Ｒ１の一端側に位置する中立位置Ｎ２との間に位置するガイド突部３２ｂ、前記後進操作域Ｒ１と一直線状に並んで位置する前進操作域Ｆ２のそれぞれをレバーガイド３２に備えさせることにより、前記中立位置Ｎ１を油圧モータＭを停止状態に維持するための中立位置とし、前記前進操作域Ｆ２を前記中立弁１６の閉じ状態１６ａから開き状態１６ｂへの切り換えを促進させるための切換え促進位置Ｆ２とするとともに、後進操作域Ｒ１に操作された変速レバー３０は切換え促進位置Ｆ２を経過させて中立位置Ｎ１に切り換え操作させるように構成してある。

【００３１】すなわち、変速レバー３０を前記中立位置Ｎ１とＮ２のいずれに操作しても斜板操作部材１５が前記停止域Ｎになって油圧モータＭを停止状態に操作できるが、中立位置Ｎ２の方にあっては変速レバー３０をその位置Ｎ２に保持しにくく、中立位置Ｎ１の方にあっては変速レバー３０を前記位置決め部３２ａやガイド突部３２ｂによる受け止めによってその位置Ｎ１に容易に保持できる。これにより、走行停止の際には、変速レバー３０を中立位置Ｎ１に操作して油圧モータＭを停止状態に維持させる。そして、後進時には、変速レバー３０を後進操作域Ｒ１からガイド突部３２ｂを迂回して中立位置Ｎ１に切り換え操作して走行停止させるため、変速レバー３０を後進操作域Ｒ１から切換え促進位置Ｆ２に一度切り換え操作し、この後中立位置Ｎ１に切り換え操作する。そして、変速レバー３０を後進操作域Ｒ１から切換え促進位置Ｆ２に切り換え操作すれば、斜板操作部材１５が後進域Ｒから前進域Ｆに切り換わり、油圧ポンプＰが後進側から前進側の駆動に切り換え操作することになる。すると、油圧ポンプＰを後進駆動から単に停止状態に切り換え操作しただけでは、油圧モータＭに前進側に回動させる操作力が作用しているなどによって駆動油路１４が圧力低下しにくく、中立弁１６が閉じ状態１６ｂから開き状態１６ａに切り換わりにくい場合でも、油圧ポンプＰが前進側に駆動されて駆動油路１４に油抜き作用することにより、駆動油路１４の圧力が低下させて中立弁１６を閉じ状態１６ｂから開き状態１６ａに切り換わりやすくする。すなわち、変速レバー３０を中立位置Ｎ１に操作して走行停止させる際、中立弁１６を開き状態１６ａに切り換わりやすくして停止させられる。

【００３２】図７に示すように、前記左右一対の線引きマーカー４，４それぞれは、走行機体に固定の支持部材３４に基端側が機体上下方向の軸芯まわりで回動自在に連結する基端側マーカ部分４ａと、この基端側マーカ部分４ａの先端側に基端側が水平方向の軸芯まわりで回動自在に連結する先端側マーカ部分４ｂと、この先端側マーカ部分４ｂの先端側から延出する線引き杆４ｃとによって構成し、基端側マーカ部分４ａを支持部材３４に対して揺動操作するとともに、先端側マーカ部分４ｂを基端側マーカ部分４ａに対して上下に揺動操作することにより、作業時には、図１に示す如く線引き杆４ｃの先端側が圃場に接地して線引き作用する使用姿勢に切り換えられ、非作業時には、図７に示す如く先端側マーカ部分４ｂが予備苗載せ台装置３の前側付近で機体上下向きになる格納姿勢に切り換えられるようにしてある。すなわち、基端側マーカ部分４ａを支持部材３４から機体横外側に向かって延出する取り付け姿勢で、先端側マーカ部分４ｂを基端側マーカ部分４ａから機体横外側に向かってほぼ一直線状に並んで延出する取り付け姿勢にすれば、使用姿勢になる。そして、基端側マーカ部分４ａを支持部材３４から機体前方向きに機体前後方向に沿って延出する取り付け姿勢で、先端側マーカ部分４ｂを予備苗載せ台装置３の前側付近で基端側マーカ部分４ａから機体上方向きに延出する取り付け姿勢にすれば、格納姿勢になる。線引きマーカー４を格納した際には、先端側マーカ部分４ｂの先端側を予備苗載せ台装置３の苗載せ台支柱３ａから延出する支持杆３５の先端側のフック部３５ａに係止させることにより、線引きマーカー４を走行振動などで突出しないように格納姿勢に保持するようにしてある。図８に示すように、予備苗載せ台装置３の苗載せ台３ｂにマット状苗３６を載置した際にマット状苗３６の角部が苗載せ台３ｂから外側に出る状態に苗載せ台３ｂがなっているが、苗載せ台３ｂにマット状苗３６が載置されている場合でも、前記フック部３５ａがマット状苗３６よりも外側に位置して先端側マーカ部分４ｂを掛けられるように支持杆３５を形成してある。

【００３３】前記苗植付装置９は、それぞれが複数個の苗植付機構９ａや一つの分割苗載せ台部分９ｂを備える左右一対の苗植付装置部分に分割できるように構成し、各分割苗植付装置部分のリンク機構８に対する連結姿勢を変更することにより、作業時には、図１に示す如く各

分割苗植付装置部分の苗植付機構９ａが走行機体の横方向に並ぶとともに、両分割苗植付装置部分の分割苗載せ台部分９ｂが走行機体の横方向に並んで一枚の苗載せ台になるように両分割苗植付装置部分が機体横方向に並んでリンク機構８に連結する作業用姿勢に切り換えられ、機体を移動走行させたり、運搬車に載せたりする非作業時には、図９に示す如く各分割苗植付装置部分の苗植付機構９ａが走行機体の前後方向に並ぶとともに、両分割苗植付装置部分の分割苗載せ台部分９ｂの横幅方向が走行機体の前後向きになるように両分割苗植付装置部分が機体横方向に並んでリンク機構８に連結する折り畳み姿勢で持ち上げ支持される格納姿勢に切り換えられるようにしてある。苗植付装置９を前記格納姿勢にした際には、リフトシリンダ７にストッパー３７を装着して苗植付装置９の下降防止を図るようにしてあり、このストッパー３７は、図１０又は図１２に示す如く構成してある。

【００３４】図１０と図１２のいずれに示すストッパー３７も、リフトシリンダ７のシリンダロッド７ａがクッションばね３８を受け止め支持するように備えるバネ受け具３９と、リフトシリンダ７のシリンダチューブ７ｂとの間に装着し、シリンダロッド７ａに突っ張り支持させるように構成してある。すなわち、苗植付装置９などの重量がリフトシリンダ７に掛かり、リフトシリンダ７の制御弁に油漏れが発生してリフトシリンダ７が短縮することを防止するようにしてある。

【００３５】図１０に示すストッパー３７の場合、シリダロッド７ａが保持する前記クッションばね３８のためのカバー４０に、図１１に示す如きストッパーホルダー４１を支持させ、ストッパー３７をリフトシリンダ７に装着した際、ストッパー３７が着脱操作のために備える把手４２を形成する部材の一部分４２ａをストッパーホルダー４１のキャッチ部にこれを弾性変形させながら嵌め込むようにしてある。すなわち、ストッパーホルダー４１を把手４２に保持作用させ、ストッパー３７がリフトシリンダ７から外れることの防止を図るようにしてある。

【００３６】図１２に示すストッパー３７の場合、シリンダロッド７ａが保持する前記クッションばね３８のためのカバー４０に、図１３に示す如きストッパーピン４３ａを有するストッパーホルダー４３を付設し、ストッパー３７をリフトシリンダ７に装着した際、ストッパーピン４３ａから延出する操作アーム４３ｂにより、ストッパーピン４３ａをピンホルダー４３ｃ対してストッパー３７の方にスライド操作し、ストッパーピン４３ａの先端側をストッパー３７が備える一対の突出片４４，４４それぞれのピン孔に挿入して突出片４４に係止させるようにしてある。すなわち、ストッパーホルダー４３のストッパーピン４３ａをストッパー３７に係止作用させ、ストッパー３７がリフトシリンダ７から外れることの防止を図るようにしてある。

【００３７】前記電動シリンダ２６に替え、油圧シリンダなどを採用して実施してもよいのであり、これらを総称してアクチュエータと呼称する。

【００３８】本発明による走行用無段変速装置は、田植機の他、農用トラクター、芝刈機、コンバイン等の各種作業車に装備される変速装置にも適用できる。

【図面の簡単な説明】

【図１】乗用型田植機全体の側面図

【図２】油圧回路図

【図３】斜板操作部材の操作位置を示す説明図

【図４】変速操作構造の概略図

【図５】変速レバーの操作位置を示す説明図

【図６】別実施形態の油圧回路図

【図７】線引きマーカー格納状態の側面図

【図８】線引きマーカーの支持杆の作用を示す説明図

【図９】苗植付装置の折り畳み格納状態の側面図

【図１０】ストッパーの使用状態を示す説明図

【図１１】ストッパーホルダーの斜視図

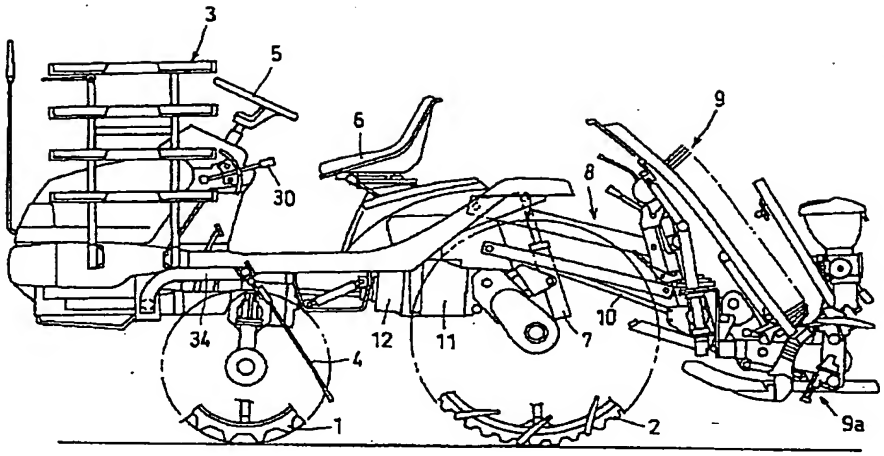
【図１２】別実施形態のストッパーの使用状態を示す説明図

【図１３】別実施形態のストッパーホルダーの正面図

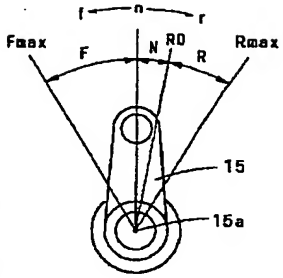
【符号の説明】

１３　駆動油路
１４　駆動油路
１６　中立弁
１７　第１排油路
１８　第２排油路
１８ａ　絞り部
２６　アクチュエータ
３０　変速レバー
Ｐ　油圧ポンプ
Ｍ　油圧モータ
Ｒ１　後進操作域
Ｎ１　中立位置
Ｆ２　切換え促進位置

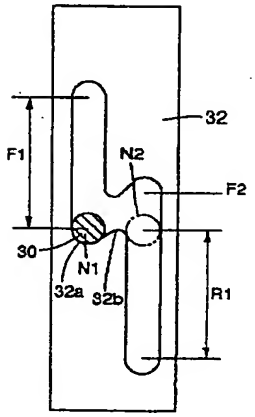
【図1】



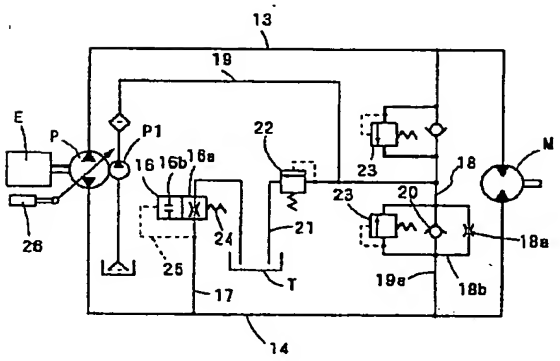
【図3】



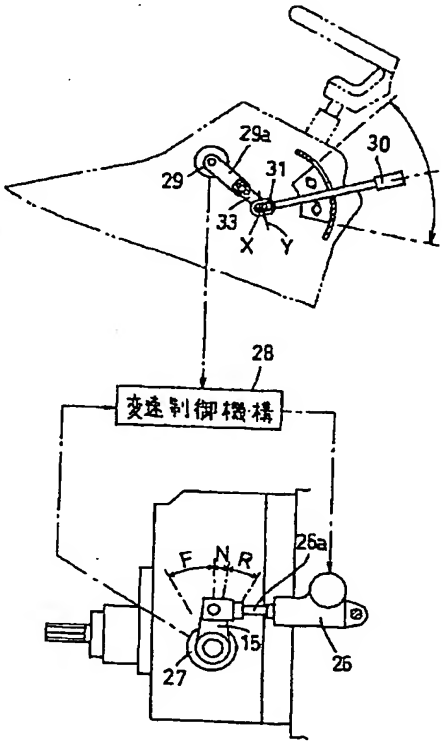
【図5】



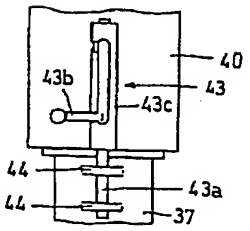
【図2】



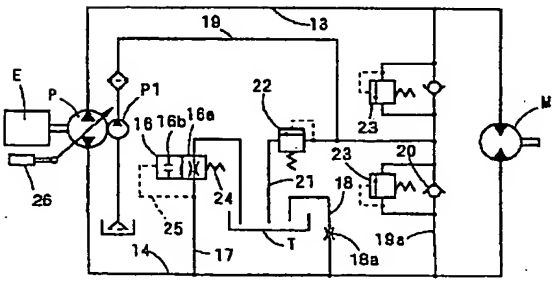
【図4】



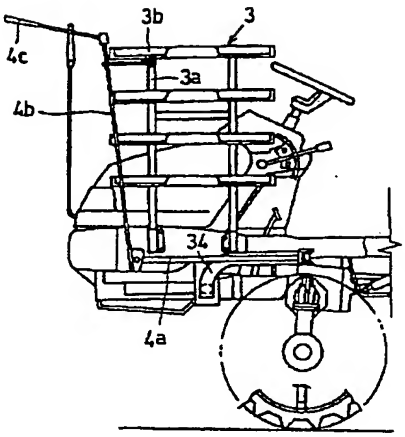
【図13】



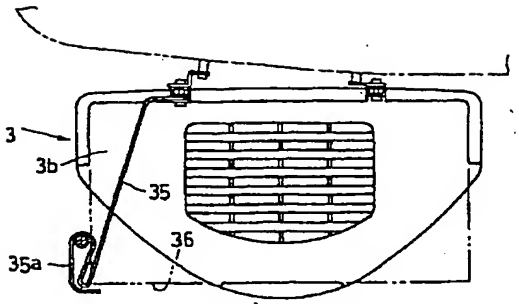
【図6】



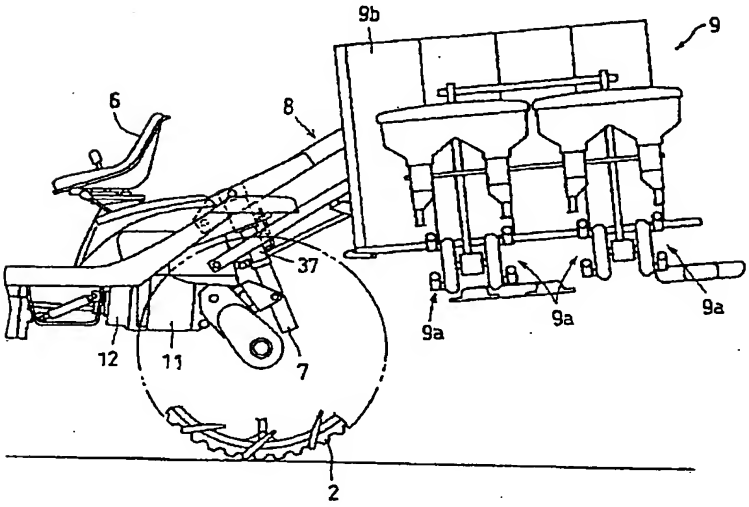
【図７】



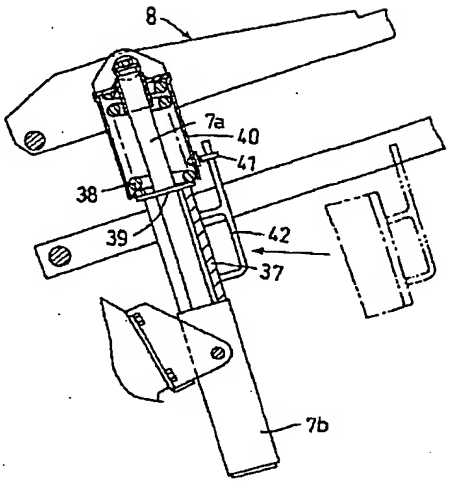
【図８】



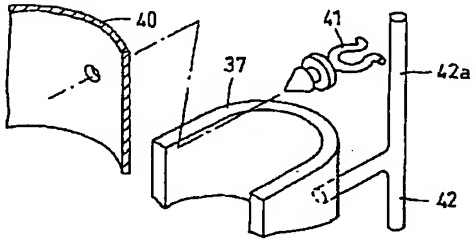
【図９】



【図１０】



【図１１】



【図１２】